DOCUMENT RESUME

ED 286 156 CS 008 924

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TITLE Levels of Phonological Awareness.
PUB DATE 22 Apr 87
NOTE 21p.; Paper presented at the Annual Meeting of the American Educational Research Association (Washington, DC, April 20-24, 1987).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Beginning Reading; Decoding (Reading); *Language Acquisition; Language Research; Linguistics; *Phonemes; Phonics; *Phonology; Primary Education; Reading Ability; Reading Instruction; *Reading Processes; Reading Research; Sight Method; *Syllables; Teaching Methods
IDENTIFIERS *Syllabication Ability

ABSTRACT

While previous studies have investigated children's awareness of two units within words--syllables and phonemes, there is experimental evidence that children are also aware of intrasyllabic units (units intermediate in size between the syllable and the phoneme), and that these units may be useful for teaching phonological awareness and reading. Two experiments investigated children's awareness of phonemes and of two intrasyllabic units, onset (the initial consonant or consonant cluster) and rime (the vowel and any following consonants) in spoken words. Fifty-six kindergarten students participated in the first experiment, and results indicated that while they were aware of both syllables and intrasyllabic units in a word comparison task, they were not aware of phonemes in the same task. Results of the second experiment, in which 20 first grade students compared words differing only in onset complexity, yielded similar results, which again indicates that children find it easier to divide syllables into onsets and rimes than into phonemes. The findings suggest that word segmentation instruction should be sequenced with syllable segmentation instruction and precede instruction in onset and rime segmentation, leaving phoneme segmentation instruction last. Findings also suggest that the ideal approach to reading instruction is a compromise between the whole word approach, which ignores children's ability to segment words, and the phonics approach, which over-emphasizes phonemic segmentation. (References, figures, and tables conclude the document.) (SKC)

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Levels of phonological awareness

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Paper presented at American Educational Research Association,

Washington, DC, April 22, 1987

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In discussing the role of phonological awareness in the learning of English, or of other writing systems, it is important to distinguish among different types of phonological units. Previous researchers have studied children's awareness of two types of units within the word -- the syllable and the phoneme. In this talk, I will suggest that units intermediate in size between the syllable and the phoneme must also be considered. The talk will be divided into two parts. In the first part, I will introduce the notion of intrasyllabic units and will present some experimental evidence on children's awareness of these units. In the second part of the talk, I will discuss how intrasyllabic units might be used in the teaching of phonological awareness and in the teaching of reading.

Many linguists have viewed the syllable as a string of individual sounds or phonemes. Thus, the syllable "blast" was thought to consist of "b" followed by "l" followed by "a", "s", and "t", as shown in the top part of Figure 1. Recently, however, this linear view of the syllable has been challenged. A number of linguists (e.g., Fudge, 1969; Selkirk, 1982; Vergnaud & Halle, 1979) have adopted a hierarchical view of the syllable, as depicted in the bottom part of Figure 1. (For a review of the psychological evidence favoring the hierarchical view over the linear view, see Treiman, in press.) In the hierarchical view, the syllable is said to consist of two parts, an onset and a rime. These parts are in turn composed of phonemes. The onset of a syllable is the initial consonant or consonant cluster. Thus, the onset of "blast" is "bl". The rime of a syllable is the vowel and any following consonants. The rime of "blast" is "ast". The onset and rime units are in turn composed of

phonemes. Figure 2 shows some other examples of onset and rime units. The syllable "last" contains an "l" onset plus an "ast" rime. "blue" contains a "bl" onset followed by a rime consisting of just a vowel.

In my research, I have studied children's awareness of the intrasyllabic units of onset and rime. Previous researchers (e.g., Fox & Routh, 1975; Hardy, Stennett, & Smythe, 1973; Leong & Haines, 1978; Liberman, Shankweiler, Fischer, & Carter, 1974; Treiman & Baron, 1981) have suggested that children are more aware of higher level linguistic units than of lower level units. These previous studies have examined words, syllables, and phonemes; they have not looked at intrasyllabic units. If there is a general tendency for children to be more aware of higher level linguistic units than of lower level units, we would expect children's awareness of intrasyllabic units to be intermediate between their awareness of syllables and of phonemes. That is, children may proceed from the ability to segment spoken words into syllables, to the ability to segment syllables into onsets and rimes, and finally to the ability to segments onsets and rimes into phonemes.

To test whether awareness of onsets and rimes is fact intermediate between awareness of syllables and awareness of phonemes, we have been conducting a study of children's ability to compare units in spoken words. The study has three conditions, as shown in Table 1. In the syllable condition, the child is told that a puppet likes words that "sound the same". The words that the puppet likes can sound the same either at the beginning or the end. For example, the puppet likes the words "tickle" and ticket", which

sound the same at the beginning. The puppet also likes the pair "raccoon", "cocoon", which sound the same at the end. If the words do not sound the same at the beginning or the end, the puppet doesn't like them. So, the puppet doesn't like the pair "orchard", "level". On every trial, the child hears a pair of words and has to say whether the puppet likes the words. The experimenter tells the child whether his or her answer is correct or incorrect. We are interested in whether children can catch on to this syllable comparison task. Are they able to achieve a criterion of six consecutive correct answers and, if so, how long does it take them to reach the criterion?

In the second condition of the experiment, we look at children's ability to compare onsets and rimes. Here, the puppet likes pairs like "plank" and "plea", which share a consonant-consonant onset, and pairs like "spit" and "wit", which share a vowel-consonant rime. As in the examples in Table 1, all the positive pairs share an entire consonant-consonant onset or an entire vowel-consonant rime. Negative pairs are also included, as shown in the table. The procedure for the onset/rime condition is identical to that for the syllable condition -- we tell the child that the puppet likes words that sound the same either at the beginning or at the end and we see whether the child can catch on to the task.

Finally, the third condition of the experiment examines children's awareness of phonemes. Here, the positive pairs that sound alike at the beginning share just the first consonant of the initial two-consonant cluster rather than the entire onset. The positive pairs that sound alike at the end share the final consonant

of the rime but do not share the entire rime. As suggested in Table 1, the positive stimuli for the phoneme condition are made up of the same words as in the onset/rime condition; the words are simply re-paired. The negative stimuli for the phoneme condition are identical to the negative stimuli for the phoneme condition.

So far, we have run 56 kindergarteners in the study. Each child participated in one of the three conditions. The results are shown in Table 2. As expected on the basis of previous research, the syllable condition was easiest and the phoneme condition was most difficult. Of primary interest here, the onset/rime condition appears to be intermediate in difficulty between the syllable condition and the phoneme condition. When we look at the percentage of children who reached the criterion of six consecutive correct responses, we find that about 90% of the kindergarteners in the syllable condition did so, a little over 70% of the children in the onset/rime condition did so, but only about 40% of the children in the phoneme condition reached criterion. The onset/rime condition is also intermediate in terms of the percentage of children who reached the criterion without making any errors. Over 40% of the children in the syllable condition reached criterion without errors, about a quarter of the children in the onset/rime condition did so, and only about 17% of the children in the phoneme condition did so. Finally, when we look at the total number of errors that the children made (out of a maximum of 40), the mean number of errors was 4.1 in the syllable condition, 6.8 in the onset/rime condition, and 13.9 in the phoneme condition. The error difference between the onset/rime condition and the syllable condition is not statistically significant

with the number of subjects we have run so far; the difference between the onset/rime condition and the phoneme condition is.

There are also some interesting results when we compare the items that sounded alike at the beginning to those that sounded alike at the end. (See Table 3.) In the syllable condition, there was no significant difference between these two types of items. Children did equally well on pairs like "tickle" and "ticket" and pairs like "raccoon" and "cocoon". In the onset/rime condition, pairs that sounded alike at the end (e.g., "spit", "wit") were significantly easier than pairs that sounded alike at the beginning (e.g., "plank", "plea"). In other words, shared rimes were more easily noticed than shared onsets. This result is consistent with previous findings that children are particularly sensitive to rhyme (Jusczyk, 1977; Stanovich, Cunningham, & Cramer, 1984). The pattern of results in the phoneme condition was the opposite of that in the syllable condition. In the phoneme condition, children made significantly more errors on pairs that shared a phoneme at the end than on pairs that shared a phoneme at the beginning. That is, they performed more poorly on pairs like "spit", "flat" than on pairs like "plank", "prove". Thus, it is not the case that the beginnings of words are always easier than the ends of words, or vice versa. The position effects depend upon which linguistic level is involved.

To summarize the results of Experiment 1, most kindergarteners can show an awareness of syllables and of intrasyllabic units in the comparison task. However, the majority of kindergarteners are not able to show an awareness of phonemes in this same task.

Is the superiority of onsets and rimes over phonemes simply due to the fact that onsets and rimes are usually longer than single phonemes? For example, in Experiment 1 the positive stimuli in the onset/rime condition shared two phonemes, as in "plank" and "plea". The positive stimuli in the phoneme condition shared one phoneme, as in "plank" and "prove". Would children still show a greater awareness of onsets than of phonemes when the number of phonemes in the two units was equated? To find out, we ran a second experiment. In Experiment 2, the puppet liked words that sounded the same at the beginning only. There were two types of positive pairs, as shown in Table 4. For some of the pairs, the initial consonant was the onset. For example, "pacts" and "peel" share the onset "p". For other pairs, the initial consonant was part of the onset. For example, "plan" and prow" share an initial "p" but this time the "p" is part of the onset. Notice that for both types of pairs a single phoneme, "p", is shared. The pairs differ only in whether the "p" is the onset or part of the onset. With a pair like "pacts" and "peel", a child can succeed by analyzing the syllables into onsets and rimes. The child does not need to be able to analyze the onsets into their component phonemes. With a pair like "plan" and "prow", on the other hand, analysis of the syllables into onset and rime units will not yield success. To determine that "plan" and "prow" start with the same sound, the child must analyze the "pl" onset and the "pr" onset into phonemes. Hence, we predict that children will have more difficulty on pairs like "plan" and "prow" than on pairs like "pacts" and "peel". There were also pairs that did not begin with the same sound, like "bomb" and "drip".

The procedure of Experiment 2 was similar to that of Experiment 1, except that the puppet liked words that sounded the same at the beginning only. Also, the children were not told whether their answers were right or wrong. Because no feedback was given, we ran Experiment 2 with older children — 20 first grade students. As shown in Table 4, the first graders did well in general, accepting the words that began with the same sound and rejecting the ones that did not. As predicted, however, the children made more errors on pairs like "plan" and "prow" than on pairs like "pacts" and "peel". This difference, which was statistically significant, suggests that it is harder for children to abstract out the "p" when it is part of an onset than when it is the onset.

The results of the two experiments suggest that it is easier for children to divide syllables into onsets and rimes than to divide them into phonemes. Even when we are looking at a particular unit, like a "p", it is easier for children to deal with that unit when it is an onset than when it is part of an onset. From a theoretical point of view, the results that I have discussed support the idea that syllables have a hierarchical internal structure rather than a linear structure. Children are more aware of higher levels within this structure, like syllables and onsets and rimes, than of lower levels. The results also have some practical implications for the teaching of reading. I would like to discuss two possible implications.

First, the idea that syllables are composed of onsets and rimes, which in turn are composed are phonemes, has some implications for how phonological awareness skills should be taught. Many researchers

and educators have suggested that children be given training in phonological awareness prior to, or at the same time as, being taught to read. How might this phonological awareness instruction be sequenced? Several existing programs (e.g., Rosner, 1974; Rozin & Gleitman, 1977; Williams, 1980) begin with the analysis of words into syllables. From there, they proceed to the analysis of syllables into phonemes. While most children have little difficulty learning to segment words into syllables, some -- particularly those from disadvantaged backgrounds -- experience great difficulty with phoneme segmentation. Part of the reason for this may be that the programs are missing an important intermediate step. Instead of proceeding directly from analysis of words into syllables to analysis of syllables into phonemes, perhaps they should go from analysis of words into syllables to analysis of syllables into onsets and rimes. At this intermediate stage, children would learn to analyze a word like "blast" into "bl" and "ast" and a word like "made" into "m" and "ade". They would not yet be asked to divide the "bl" initial cluster into "b" and "l" or the "ade" group into "a" followed by "d". Only after children had mastered the onset/rime level would they begin to learn to analyze onsets and rimes into phonemes. By adding an intermediate onset/rime step, we might make it easier for children to learn to analyze syllables into phonemes.

The idea that syllables are composed of onset and rime units also has some implications for how reading might be taught. Traditionally, there has been a distinction between the whole word approach, in which children learn relationships between whole printed words and their pronunciations, and the phonics approach, in which

children learn relationships between individual letters and individual phonemes. A disadvantage of the whole word approach is that each treats each printed word as a separate unit. Children are not explicitly taught the tools that they need in order to decipher new printed words. While the phonics approach does attempt to teach decoding skills, a disadvantage of this approach is that it relies on correspondences between print and speech at the level of phonemes. As we have seen, many young children lack awareness of phonemes; this may make relationships between letters and phonemes difficult for them to learn.

The work that I have reviewed suggests a compromise between whole word methods and phonics methods. Given that many young children <u>can</u> analyze spoken words into onsets and rimes, beginning reading instruction might stress correspondences between spellings and sounds at the level of onsets and rimes rather than at the level of whole words or at the level of phonemes. For example, instead of learning that the whole written word BLAST corresponds to the whole spoken word "blast" -- something which is relatively easy for children to learn but which won't help them with new words -- or instead of trying to decode BLAST based on individual correspondences between B and "b", L and "l", A and "a", S and "s", and T and "t" -- something which is quite difficult for young children -- children could learn that the letter group BL corresponds to the "bl" sound and that the letter group AST corresponds to the "ast" sound. Likewise, children could learn that M corresponds to "m" and ADE corresponds to "ade". Equipped with these correspondences between printed letters and letter groups and spoken onset and rime units,

children could decipher new words like BLADE and MAST. Because children are more aware of onset and rime units than of phoneme units, they may find it easier to learn relationships between printed and spoken words when these relationships are introduced at the level of onsets and rimes than at the level of phonemes.

While we want children to eventually achieve an awareness of phonemes, and to eventually learn the relationships between phonemes and letters, reading instruction need not begin at the level of phonemes. Instead, children could begin to learn about the relationships between print and speech at the level of onsets and rimes.

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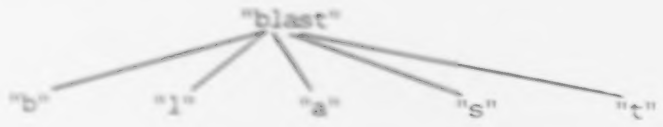
Acknowledgments

The research reported here was supported by NICHD Grant HD 20276. I thank Cathy Beiser and Andrea Zukowski for their assistance.

Figure 1
Linear versus hierarchical views of the syllable

Linear view of the syllable:



Hierarchical view of the syllable:

Figure 2
Examples of onset/rime structure of spoken words

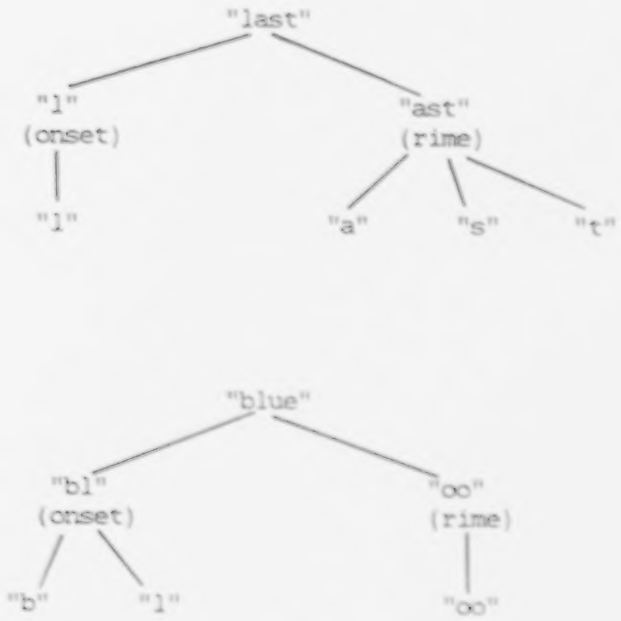


Table 1
Sample stimuli for Experiment 1

Syllable condition:	
Shared syllable at beginning:	tickle, ticket butter, button
Shared syllable at end:	raccoon, cocoon entire, retire
No shared syllable:	orchard, level harpoon, collide
Onset/rime condition:	
Shared onset at beginning:	plank, plea pray, prove
Shared rime at end:	spit, wit rat, flat
No shared onset or rime:	twist, brain sage, quiz
Phoneme condition:	
Shared phoneme at beginning:	plank, prove pray, plea
Shared phoneme at end:	spit, flat rat, wit
No shared phoneme:	twist, brain sage, quiz

Table 2
Results of Experiment 1

	Syllable	Onset/rime	Phoneme
% of subjects reaching criterion	89.5	73.7	38.9
% of subjects reaching criterion without errors	42.1	26.3	16.7
Mean number of errors (maximum = 40)	4.1	6.8	13.9

Table 3
Percent correct as a function of position of identical element, Experiment 1

	Syllable	Onset/rime	Phoneme
Same at beginning	91.6%	81.1%	61.3%
Same at end	89.5%	88.9%	50.0%

Table 4
Sample stimuli and results for Experiment 2

Stimulus type	Examples	Percent correct
Shared onset	pacts, peel born, bump	89.5%
Shared part of onset	plan, prow bran, blue	81.5%
No shared initial consonant	bomb, drip fern, shrill	93.0%